Industrial Calibration Update

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• A tale of two github repositories
  • Ros-industrial/Industrial_calibration
  • Jmeyer1292/robot_cal_tools

• What are they?
  • Intrinsic calibration
  • Eye-hand calibration
  • Multi-camera extrinsic calibration
    • Stereo-calibration
    • Network of cameras for Close Range Photogrammetry
  • RGBD calibration
  • Robot kinematic calibration
  • Analysis
Underlying Principle – Perspective Projection

- Perspective Projection
- Focal Point
- Image of object
- Object
- Image plane
- Focal length
- Focal Point
- Image plane

\[ u = \frac{f_x x}{z}, \quad v = \frac{f_y y}{z} \]

- Predict the image of an object
Ceres-Solver

- Known – VS – Unknown
  - Knowns => cost constructor
  - Unknowns => cost Evaluator

- Adjust Unknowns to minimize SSE (prediction-observed)
Eye-Hand Example
Difference in Intended Use

• Robot cal tools:
  • Provide stand-alone (not ROS) "optimization functions" take your data files and produce an answer to your calibration problem.
  • How you collect data and what you do with the answer is left to you.
  • Every application runs loads images, TF etc from files in designated directories.

• Industrial Calibration Library
  • Provide automated calibration that executes as part of a ROS installation. Captures and manipulates TF, Joint States, Image topics.
  • Requires significant setup/expertise to use.

• Lots of Duplicated Code
  • Ceres cost functions
  • Image processing tools to locate target features
Plan for future

• Unify Robot Cal Tools with Industrial Calibration

• Ical-Apps
  • Data
  • Standalone_apps
  • R1_apps
  • R2_apps

• Ical-Core (Pure Cmake)
  • Cost functions
  • Optimizers (heavy lifting objects for apps, both R1, R2 and Stand alone)
  • Targets
  • Plugins
  • GUI